COMMUNITY DEVELOPMENT DEPARTMENT
Building & Safety Inspection Division
221 West Pine St./PO Box 3006, Lodi, CA 95241-1910
(209) 333-6714

Minor Residential Rooftop Photovoltaic (PV) Permit Procedure

Policy and Procedure-G [August 2015]

1. Application, 2 sets of plans with Lodi Electric Utility (LEU) approved drawings and panel layout and 1 set of manufacturer's spec sheets/owner's manual to be submitted to Building Inspection Division by Contractor for the purpose of issuing a Minor Residential Rooftop Photovoltaic Permit.
2. Contractor to request the following inspections:
    - Final Approvals when required by Electric Utility (Contractor to call LEU main office 333-6762 and indicate PV inspection).
    - Final Inspection by Building Inspection Division 333-6716.
3. Building Inspection Division to e-mail "Service Order meter set PV system" to Finance Department once permit has been finaled.

Note: Please refer to the Electric Utility and Building Checklists for more information

MINOR RESIDENTIAL ROOFTOP PHOTOVOLTAIC FEES

		BUILDING & SAFETY PERMIT FEES	EU METERING FEES
RESIDENTIAL			
	Plan Check 1 Hour	**$ 137.00**	
	Final Inspection	**$ 137.00**	
	Sub-Total	**$ 274.00**	
Electrical Fees	Permit	**$ 69.00**	
	Sub-panel (inverter) ea	**$ 15.00**	
	Service (if 100 amp)	**$ 15.00** ($25 if 200 amp)	
	BSASRF Fee	**$ 1.00**	
Total Building Permit Fee		**$ 374.00**	

***Re-inspection fee additional (if needed) $ 137.00**

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Building Department Check List for Residential Photovoltaic Systems

Y	N	
☐	☐	Two sets of plans with LEU wet signed approvals on the electrical drawings and panel layout
☐	☐	System size is 10 KW AC CEC rating or less
☐	☐	The Cover Sheet shall include a bolded note stating that the **2013 California Residential Code, California Electrical Code, California Fire Code and 2013 California Energy Code**, Occupancy Group Division, Building Use, Parcel No. and Construction Type as amended by State of California and local jurisdiction are applicable to this project
☐	☐	Plans shall specify existing roof framing (i.e. 2 x 4 engineered trusses @ 24"oc, 2 x 6 DF#2 rafters @ 16"oc w/14' 4" span) and roofing material. Conventionally framed roofs will have the rafter spans verified against 2013 CRC, Table R802.5.1 (1). Projects with existing over-spanned rafters will require a separate building permit for the structural reinforcement of the existing roof structure to support the additional loads from the photovoltaic system. Plans, detail and structural design calculations shall be prepared by an Architect or Professional Engineer, licensed in the State of California
☐	☐	Site Plan shall show location of the Electric Service Meter, Lockable AC Disconnect, Inverters, and any other electrical equipment required for the photovoltaic installation (sub-panels, additional meter sockets, DC lockouts, etc.). City of Lodi Fire Prevention Standard for Photovoltaic Installations
☐	☐	The Lockable AC Disconnect shall be located within 10' and "in-sight" of the Electric Service Meter. City of Lodi Fire Prevention Standard for Photovoltaic Installations
☐	☐	Roof Plan shall show photovoltaic panel layout and shall clearly identify all hips, valleys and ridge lines. Panels shall be located no higher than 3' from the ridge to allow for Fire Department ventilation opportunities in case of fire. City of Lodi Fire Prevention Standard for Photovoltaic Installations
☐	☐	Roof Plan shall show required access pathways, to include: a) Minimum 3' wide pathway from ridge to photovoltaic panels b) Minimum 3' wide pathway, from eaves to ridge, at both sides of the photovoltaic panel layout c) At hips and valleys the photovoltaic panels shall not be located closer than 1.5' to a hip or valley, if panels are to be placed at both sides of the hip or valley. If the panels are to be located on only one side of a hip or valley that is of equal length then the panels may be placed directly adjacent to the hip or valley d) Pathway and ventilation requirements do not apply to patio covers, carports and trellises. City of Lodi Fire Prevention Standard for Photovoltaic Installations <u>Note:</u> If the Electric Utility Department requires the number of photovoltaic panel to be decreased, revised roof plan showing panel locations and pathways shall be re-submitted to the Building Department for review and approval
☐	☐	The plans shall include an electrical single line drawing to specify wire sizes and conduit sizes where applicable. The amount of wire in conduits shall not exceed the specifications of 2013 CEC, Chapter 9, Table 1 or the number of conductors in conduit shall not exceed the number specified in the tables in 2013 CEC, Annex C. Annex C was adopted by the City of Lodi

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Y	N	
☐	☐	Plans shall show photovoltaic system wires are adequately sized and overcurrent protection devices (circuit breakers, fuses) do not exceed the maximum overcurrent protection for the wire size (i.e. 20amp breaker/#12 Cu wire, 30amp breaker/#10 Cu wire, 40amp breaker/#8 Cu wire, etc.). 2013 CEC, Table 210.24 and Article 240.4 (D) (7)
☐	☐	The photovoltaic system breaker shall be a maximum of 20% of the service panel rating or plans shall include calculations to specify and show the sum of the ampere ratings of over-current devices in circuits supplying power to a busbar or conductor shall not exceed 120% of the rating of the busbar or conductor. 2013 CEC, Article 705.12 (D) (2)
☐	☐	Supply side connection of the photovoltaic system shall be approved by the Electric Utility Department. The sum of the ratings of all overcurrent devices connected to the power production source shall not exceed the rating of the service (conductors). The photovoltaic service disconnect shall have minimum rating of 60amps. Photovoltaic service wires shall be sized according to the disconnect means (60amp breaker/#6 Cu). 2013 CEC, Articles 705.12, 230.79 (D)
☐	☐	The one-line diagram to specify and show the Photovoltaic system breaker is located at the opposite (load) end of the service panel board from the main service breaker. 2013 CEC, Article 705.12 (D) (7)
☐	☐	Plans shall specify and show wiring inside of the building is to be protected by metal conduit. 2013 CEC, Article 690.31 (E)
☐	☐	Plans to provide complete and adequate framing details and connection requirements for the proposed photovoltaic system
☐	☐	Applicants shall provide manufacturer's specification sheets for all items/parts used in the installation
☐	☐	All photovoltaic disconnects are to be permanently labeled. Lettering to be white, minimum 3/8" high, all capital letters, Arial or similar font, on red background. Material required to be reflective, weather resistant and suitable for the environment. City of Lodi Fire Prevention Standard for Photovoltaic Installations
☐	☐	A "CAUTION: DUAL POWER SUPPLY" sign shall be supplied at the Electric Service panel. Lettering to be white, minimum 3/8" high, all capital letters, Arial or similar font, on red background. Material required to be reflective, weather resistant and suitable for the environment. City of Lodi Fire Prevention Standard for Photovoltaic Installations
☐	☐	All interior and exterior dc conduit, raceways, enclosures, and cable assemblies shall be marked with "CAUTION SOLAR CIRCUIT" signage, at every 10' of length, at turns, above and below penetrations, and at all dc combiner and junction boxes. Lettering to be white, minimum 3/8" high, all capital letters, Arial or similar font, on red background. Material required to be reflective, weather resistant and suitable for the environment. City of Lodi Fire Prevention Standard for Photovoltaic Installations

CITY OF LODI
FIRE DEPARTMENT
FIRE PREVENTION STANDARD

PHOTOVOLTAIC INSTALLATIONS

Number: H-03	Effective Date: 03/19/08	Revised Date:
Code References:		
Note: This standard is a summary of Fire Department clarifications of City and State guidelines. Information contained herein applies to typical circumstances and may not address all situations.		

Scope:

This standard was developed with safety as the principal objective. The intent of this standard is to provide the solar photovoltaic industry with information that will allow it to design, build, and install solar photovoltaic systems in a manner that meets the objectives of both the solar photovoltaic industry and the Lodi Fire Department.

If a solar photovoltaic system design does not meet the provisions in this standard the solar contractor should contact the fire department to determine if alternate means or methods would allow for a safe installation that is acceptable.

General Information about Solar Photovoltaic Systems

Solar photovoltaic systems generate electricity from the sun. As of September 2007, there are roughly 30,000 solar photovoltaic systems installed on homes, commercial buildings and free standing structures in California. Most systems are connected to the electric grid and provide power to the site. The majority of these systems do not have any battery backup equipment – instead, excess power is sent to the electric utility system.

Solar photovoltaic (PV) systems are installed with an AC disconnect within ten (10) feet of the service panel. Conduit carrying DC power connects the panels to the inverter. The inverter connects the PV system to the utility service panel. AC disconnects are not required in all jurisdictions because the main breaker provides this level of disconnect.

A DC disconnect is installed on the site side of the inverter. Typical systems seen today have an inverter located near the utility service panel. Some inverters (micro inverters, AC modules) are located at the PV panel (the solar industry refers to PV panels as “modules”). If the inverter is located at the PV panel, the conduit from the panels to the utility power supply is AC. The DC disconnect at the service panel cuts power to the inverter, which is then unable to export power to the utility service panel and prevents any solar electricity from harming service or maintenance workers on the utility side of the panel. During the day, there is power in the conduit between the PV panels and the DC disconnect.

The systems will produce up to 8 amps and up to 600 volts of electricity. This varies by installation. Multiple strings of series connected panels are connected together in a combiner box. The power output is highest on a bright day with low ambient temperatures and drops as the panels heat up (such as on a very hot day). There is no power output in the dark and there is no stored energy in the panels themselves. Service lights used by fire crews do not provide enough light to develop harmful power levels.

Panels are mounted on buildings or on ground supported frames. Roof mounted modules or panels can be one of several types:

1. Directly on a building's roof
2. Integral to the roof system of a building
3. On a rack with a space above the roof surface
4. On a free-standing structure but not on the habitable structure (such as a trellis or other free-standing support structure).

Specifically:

- Panels attached to a mounting system may be attached to the roof or rest on the roof surface.
- Panels integrated to the roof system. These types of panels are commonly referred to as Building Integrated Photovoltaic (BIPV) and are of two types:
  - Physically integrated roofing products. These resemble roof shingles or tiles and are installed along with standard roof shingles or tiles so that they blend into overall appearance of the roof. Physically integrated BIPV panels act as part of a defined roofing system.
  - Aesthetically integrated panels also resemble roof shingles or tiles and are installed along with standard roof shingles or tiles to blend into the overall appearance of the roof. Aesthetically integrated panels do not act as part of a defined roofing system.

Although it is not advisable to step or walk on any solar system due to slip and/or trip hazards, the systems are be able to support a firefighter's weight. For residential systems using panels mounted integrally with the roof of the building the panels are tested to and meet the requirements of ICC-ES AC365, Section 3.5 (Penetration Test).

Other PV products, such as those integrated with a curtain wall or as windows are not currently addressed in this standard.

Panels are located in a manner to provide the best access to sunlight. This means they are typically mounted on the south or west side facing roof façade. In residential applications, the typical roof area used is about 400 square feet. Larger size systems correspond to a higher site electricity demand.

Other types of solar energy systems that might be seen at a site do not generate electricity. These can be broken down into three major types - solar water heating, solar pool heating, and solar space conditioning. In these systems, panels and piping carry water or glycol. Glycol is used in areas where extended periods of freezing temperature levels could cause ice to damage the solar panels and/or distribution pipes.

1.0 MARKING

Marking is needed to provide emergency responders with appropriate warning and guidance with respect to isolating the solar electric system. This can facilitate identifying energized electrical lines that connect the solar panels to the inverter, as these should not be cut when venting for smoke removal.

Materials used for marking shall be weather resistant. Markings shall be installed and maintained in such a way as to remain highly visible to comply with the intent of this standard. Use UL 969 as standard to weather rating (UL listing of markings is not required).

1.1 Main Service Disconnect

The marking of the main service disconnect shall be placed in a location clearly visible from where the lever is operated. If the main service disconnect is not operable with the service panel closed, then additional marking should be placed within the main service disconnect as necessary to positively identify the disconnect switch.

1.1.1 Marking Content and Format

- MARKING CONTENT: CAUTION: DUAL POWER SUPPLY
- RED BACKGROUND,
- WHITE LETTERING,
- MINIMUM 3/8" LETTER HEIGHT,
- ALL CAPITAL LETTERS,
- ARIAL OR SIMILAR FONT, NON-BOLD,
- REFLECTIVE, WEATHER RESISTANT MATERIAL SUITABLE FOR THE ENVIRONMENT (durable adhesive materials meet this requirement)

CAUTION:
DUAL POWER SUPPLY

1.2 Shut off Marking for dc conduit, raceways, enclosures, cable assemblies, and junction boxes

Marking is required on all interior and exterior dc conduit, raceways, enclosures, cable assemblies, and junction boxes to alert the fire service to avoid cutting them. Marking shall be placed on all interior and exterior dc conduit, raceways, enclosures, and cable assemblies, every 10 feet, at turns and above and/or below penetrations and all dc combiner and junction boxes.

1.2.1 Marking Content and Format

- MARKING CONTENT: CAUTION SOLAR CIRCUIT
- RED BACKGROUND,
- WHITE LETTERING,
- MINIMUM 3/8" LETTER HEIGHT,
- ALL CAPITAL LETTERS,
- ARIAL OR SIMILAR FONT, NON-BOLD,
- REFLECTIVE, WEATHER RESISTANT MATERIAL (durable adhesive materials meet this requirement)

CAUTION SOLAR CIRCUIT

1.3 Inverters

The inverter is a device used to convert DC electricity from the solar system to AC electricity for use in the building's electrical system or the grid. Markings shall conform to the City of Lodi Electrical Utility Department Construction Standard # 942 0240.

2.0 ACCESS, PATHWAYS AND SMOKE VENTILATION

Access and spacing requirements shall be observed in order to:

- Ensure access to the roof
- Provide pathways to specific areas of the roof
- Provide for smoke ventilation opportunities area
- Provide emergency egress from the roof

Local jurisdictions may create exceptions to this requirement where access, pathway or ventilation requirements are reduced due to:

- Proximity and type of adjacent exposures
- Alternative access opportunities (as from adjoining roofs)
- Ground level access to the roof area in question
- Adequate ventilation opportunities beneath solar array (as with significantly elevated or widely-spaced arrays)
- Adequate ventilation opportunities afforded by panel set back from other rooftop equipment (shading or structural constraints may leave significant areas open for ventilation near HVAC equipment, for example.)
- Automatic ventilation device.
- New technology, methods, or other innovations that ensure adequate fire department access, pathways and ventilation opportunities.

Designation of ridge, hip, and valley does not apply to roofs with 2-in-12 or less pitch. All roof dimensions measured to centerlines.

Roof access points shall be defined as an area that does not place ladders over openings (i.e., windows or doors) and are located at strong points of building construction and in locations where it does not conflict with overhead obstructions such as tree limbs, wires, or signs.

2.1 Residential Systems—Single and Two-Unit Residential Dwellings

Plan review is required if a system is to be installed that will occupy more than 50% of the roof area of a residential building.

Examples of these requirements appear at the end of these guidelines.

2.1.1 Access

a. Residential Buildings with hip roof layouts. Panels shall be located in a manner that provides one (1) three-foot (3') wide clear access pathway from the eave to the ridge on each roof slope where panels are located. The access pathway shall be located at a structurally strong location on the building (such as a bearing wall.)

b. Residential Buildings with a single ridge. Panels shall be located in a manner that provides two (2) three-foot (3') wide access pathways from the eave to the ridge on each roof slope where panels are located.

c. Hips and Valleys: Panels shall be located no closer than one and one half (1.5) feet to a hip or a valley if panels are to be placed on both sides of a hip or valley. If the panels are to be located on only one side of a hip or valley that is of equal length then the panels may be placed directly adjacent to the hip or valley.

2.1.2 Ventilation

Panels shall be located no higher than three feet (3) below the ridge.

2.2 Commercial Buildings and Residential Housing comprised of three (3) or more units

Exception: If a local fire department determines that the roof configuration is similar to residential (such as in the case of townhouses, condominiums, or single family attached buildings), the local fire department may make a determination to apply the residential access and ventilation requirements.

Examples of these requirements appear at the end of these guidelines.

2.2.1 Access

There shall be a minimum six (6) foot wide clear perimeter around the edges of the roof.

Exception: If either axis of the building is 250 feet or less, there shall be a minimum four feet (4') wide clear perimeter around the edges of the roof.

2.2.2 Pathways

Pathways shall be established in the design of the solar installation. Pathways shall meet the following requirements:

a. Shall be over structural members
b. Center line axis pathways shall be provided in both axis of the roof. Center line axis pathways shall run on structural members or over the next closest structural member nearest to the center lines of the roof
c. Shall be straight line not less than 4 feet clear to skylights and/or ventilation hatches
d. Shall be straight line not less than 4 feet clear to roof standpipes
e. Shall provide not less than 4 feet clear around roof access hatch with at least one not less than 4 feet clear pathway to parapet or roof edge

2.2.3 Ventilation

a. Arrays shall be no greater than 150 by 150 feet in distance in either axis
b. Ventilation options between array sections shall be either:
    1. A pathway 8 feet or greater in width
    2. 4 feet or greater in width pathway **and** bordering on existing roof skylights or ventilation hatches
    3. 4 feet or greater in width pathway **and** bordering 4' x 8' "venting cutouts" every 20 feet on alternating sides of the pathway

3.0 LOCATION OF DC CONDUCTORS

Conduit, wiring systems, and raceways for photovoltaic circuits should be located as close as possible to the ridge or hip or valley and from the hip or valley as directly as possible to an outside wall to reduce trip hazards and maximize ventilation opportunities.

Conduit runs between sub arrays and to DC combiner boxes shall use design guidelines that minimize total amount of conduit on the roof by taking the shortest path from the array to the DC combiner box. The DC combiner boxes are to be located such that conduit runs are minimized in the pathways between arrays.

To limit the hazard of cutting live conduit in venting operations, DC wiring shall be run in metallic conduit or raceways when located within enclosed spaces in a building and shall be run, to the maximum extent possible, along the bottom of load-bearing members.

4.0 NON-HABITABLE BUILDINGS

These guidelines do not apply to non-habitable structures. Examples of non-habitable structures include, but are not limited to, parking shade structures, solar trellises, etc.

5.0 GROUND MOUNTED PHOTOVOLTIAC ARRAYS

Setback requirements do not apply to ground-mounted, free standing photovoltaic arrays. A clear brush area of 10' is required for ground mounted photovoltaic arrays.

6.0 ALTERNATIVE MEANS OF COMPLIANCE

Growing demand for solar photovoltaic products is leading to new products, designs, technologies, and installation methods. As new products and methods become available, local fire departments may encounter solar photovoltaic systems that will require an alternative means of compliance. Solar contractors should contact their local fire department to determine if alternate means or methods would allow for a safe installation that is acceptable to the fire department.

Authorities Having Jurisdiction Alternative Means of Compliance based on their authority HCD regulations 111.2.4 and 108.7. For example, if new products, designs, technologies or methods become available that provides sufficient alternative protection and access, pathways and ventilation opportunities for fire crews.

Diagram 1: Cross Gable Roof

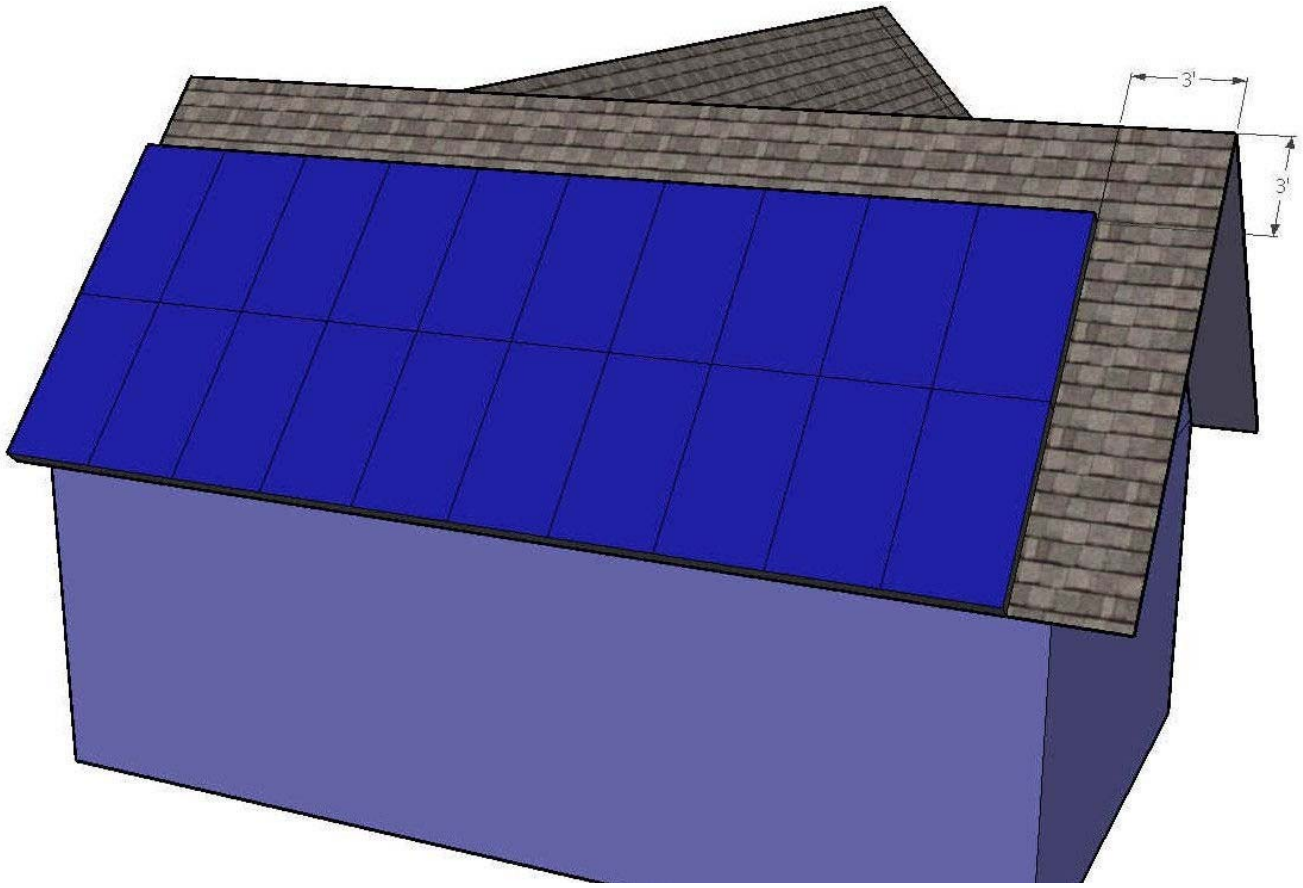


Diagram 2: Cross Gable with Valley

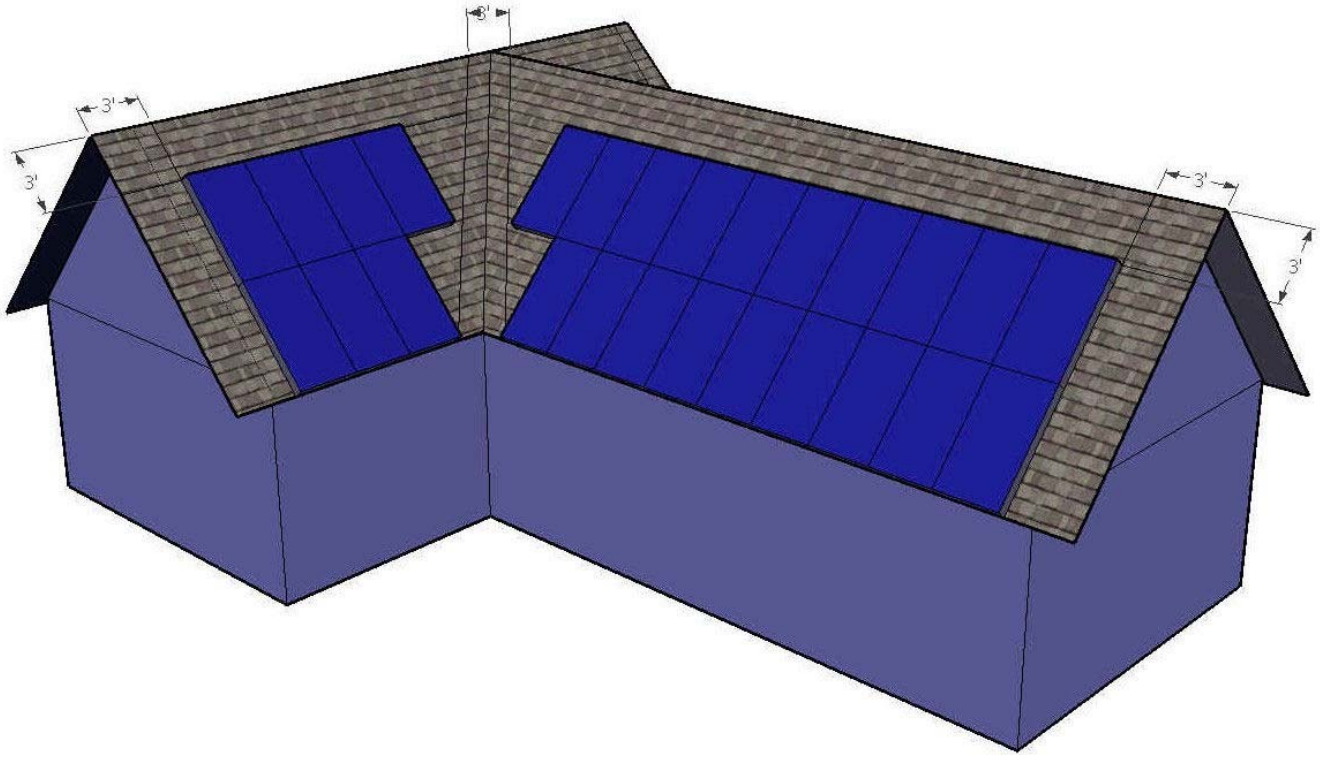


Diagram 3: Full Gable

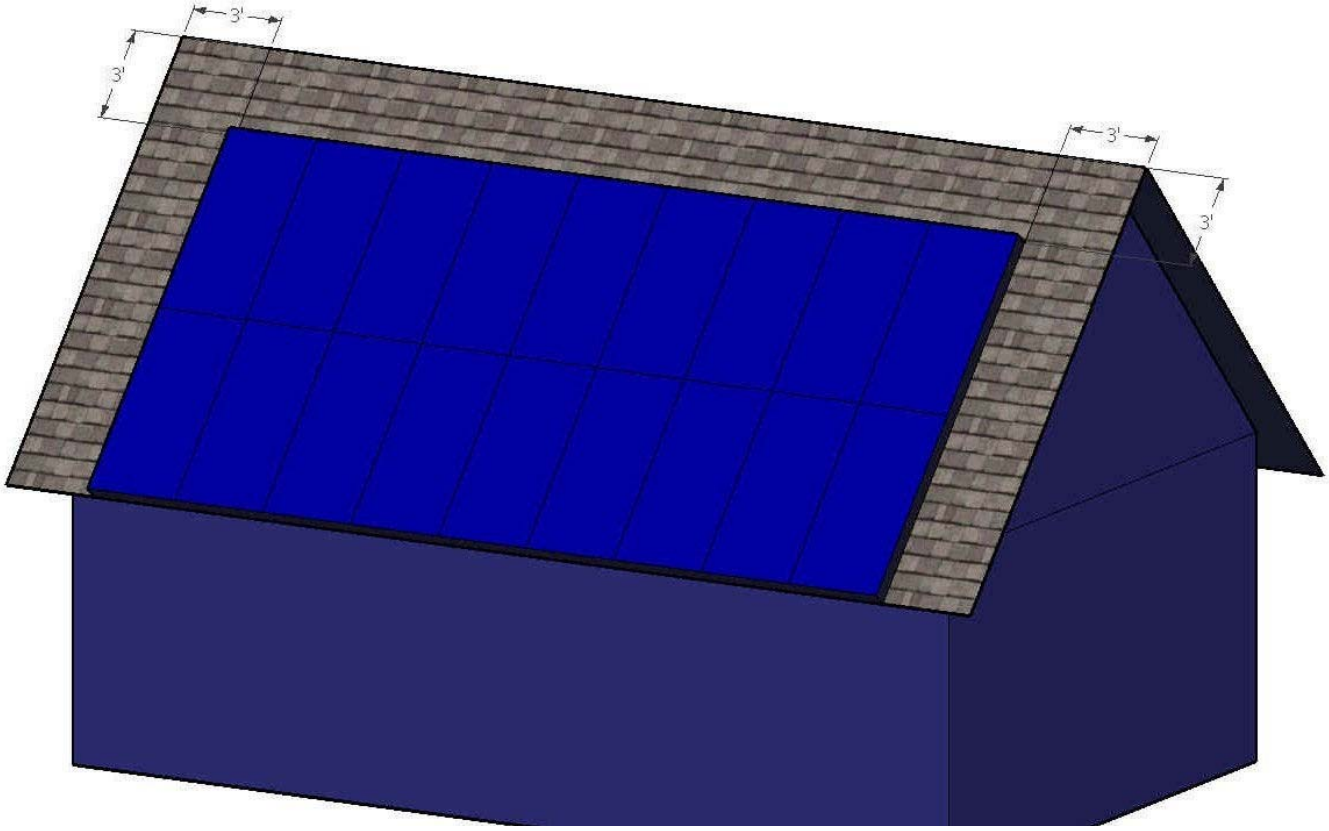
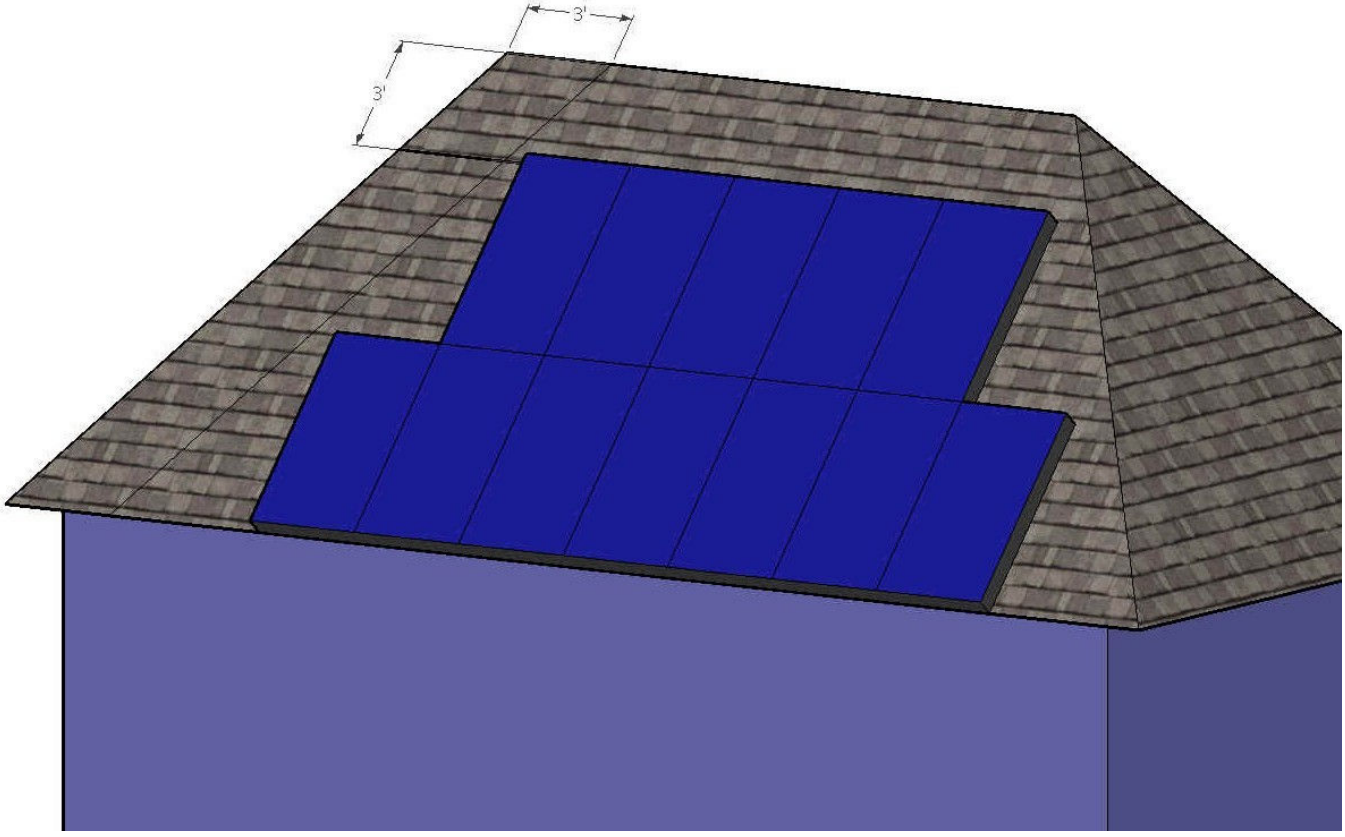


Diagram 4: Full Hip Roof



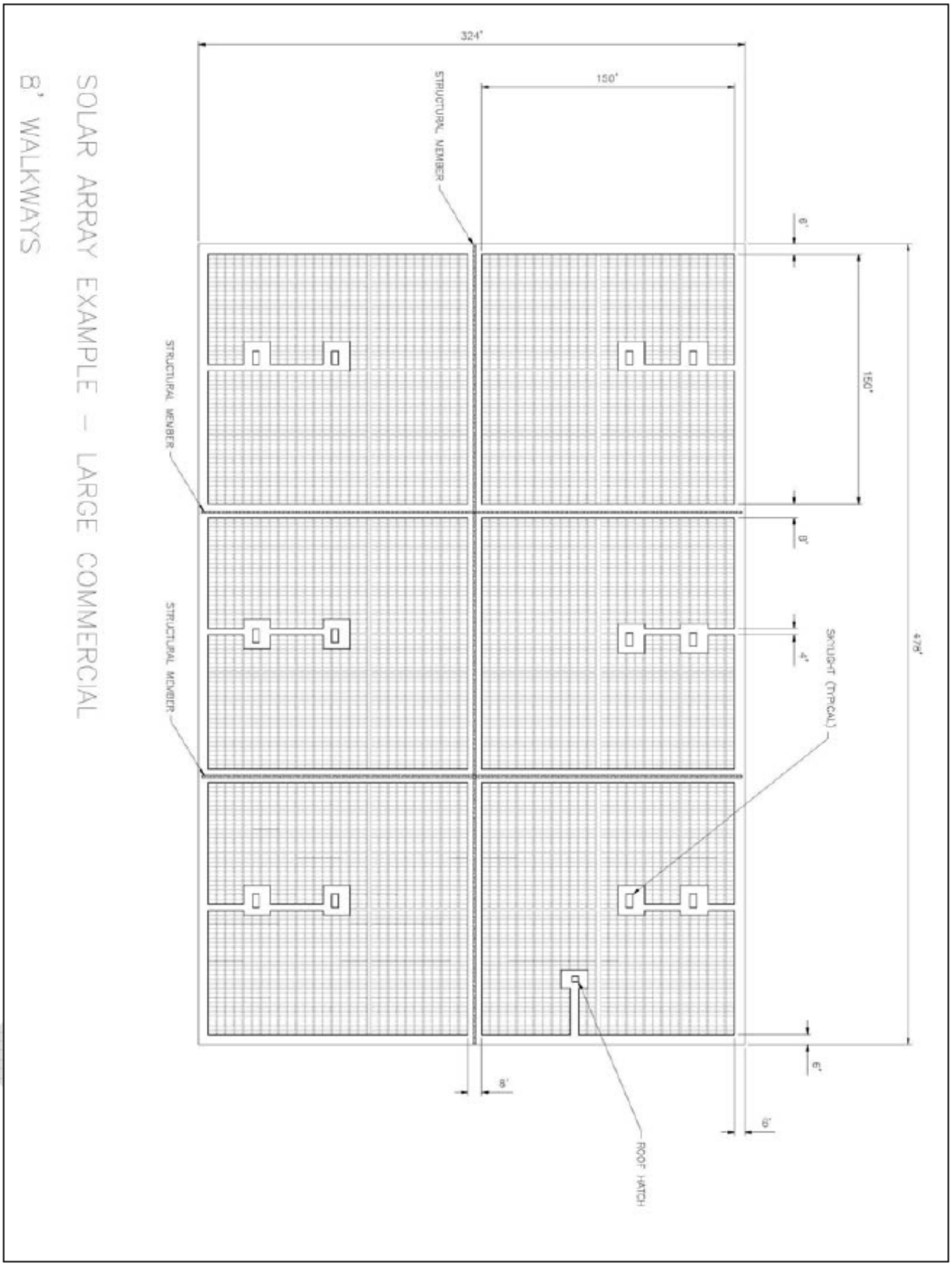


Diagram 5 – Large Commercial w/ 8' Walkways

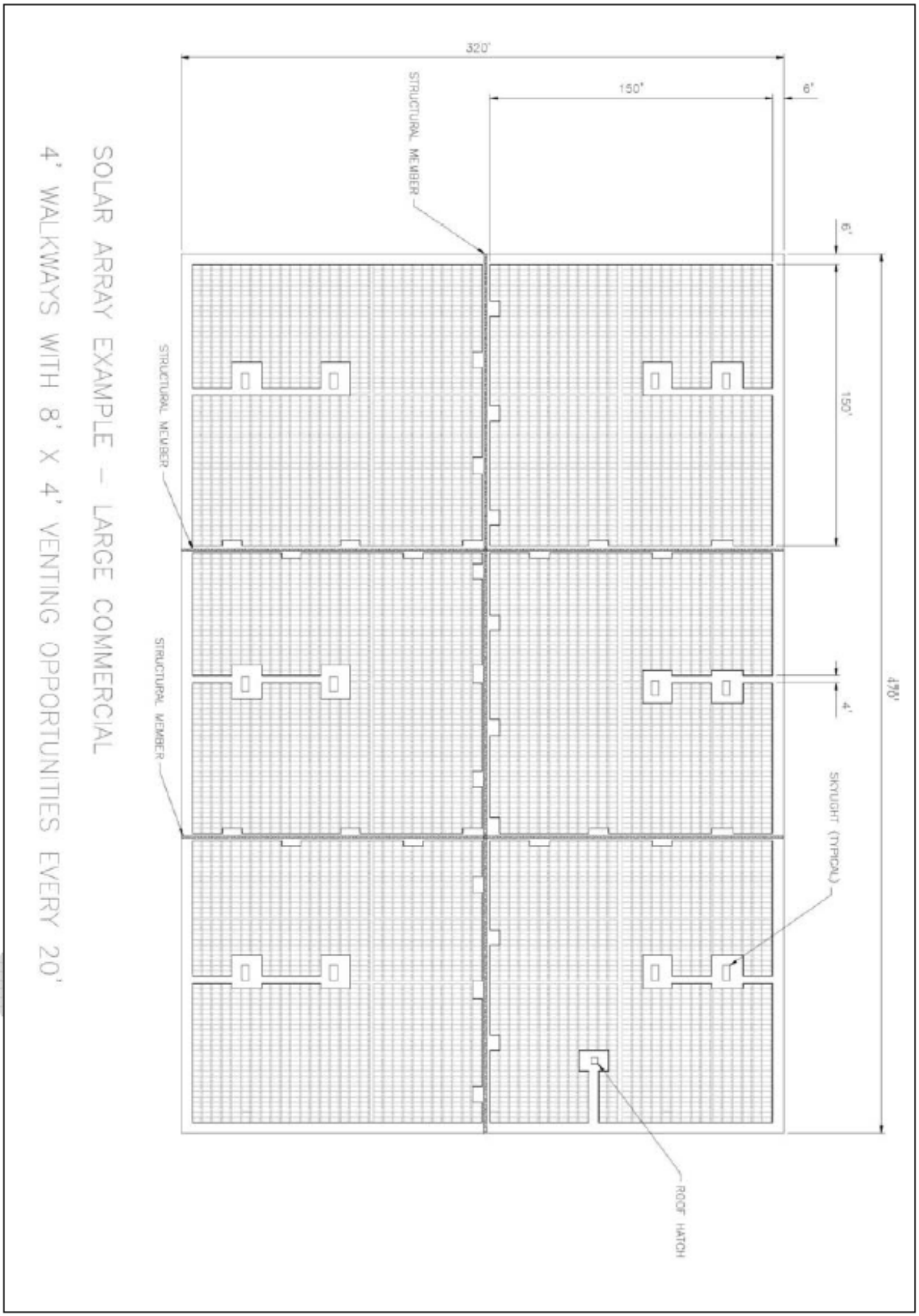


Diagram 6 – Large Commercial w/ 4' Walkways and 8' x 4' Venting Opportunities every 20'

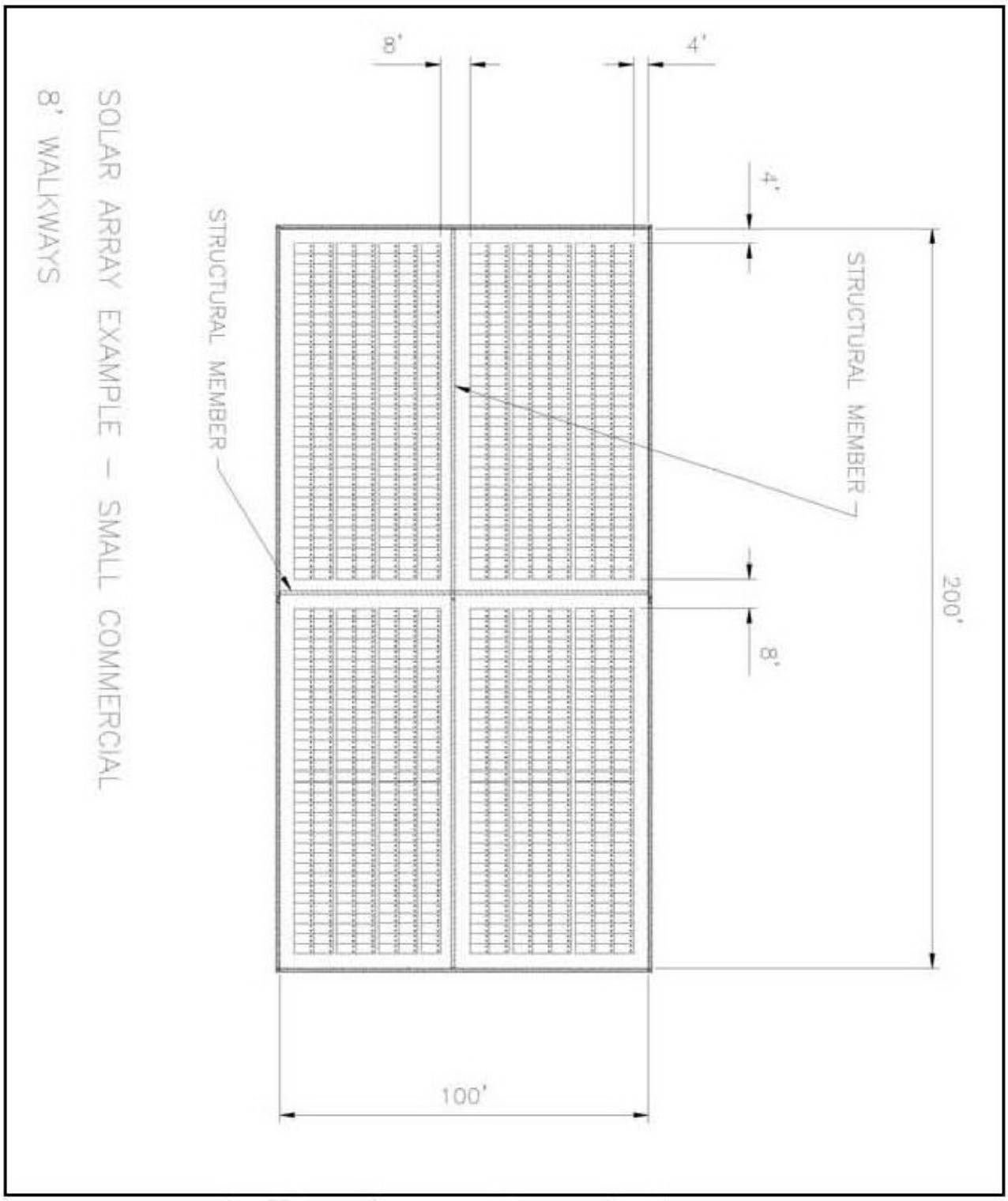


Diagram 7 – Small Commercial